

Quick Start EtherCAT TwinCAT V3 from BECKHOFF with Deutschmann UNIGATE[®] EtherCAT

Deutschmann Automation GmbH & Co. KG www.deutschmann.de | wiki.deutschmann.de

1	Download the TE1000 TwinCAT 3 software)
2	ESI (EtherCAT Slave Information)	;
	2.1 ESI - UNIGATE [®] CL, CM, CX, EL and MB:	
	2.2 ESI - UNIGATE [®] IC and IC2	3
3	Start TwinCAT V3	ļ
4	Selected device found)
5	New device found or mismatch with ESI file	;
6	Input and Output Modules)
	6.1 Input and Output modules configured via EtherCAT Master	
7	Reload Device Description	Ļ
8	Servicing	5
	8.1 Returning a device	
	8.2 Downloading PC software	

Deutschmann Automation GmbH & Co. KG

Disclaimer of liability

We have checked the contents of the document for conformity with the hardware and software described. Nevertheless, we are unable to preclude the possibility of deviations so that we are unable to assume warranty for full compliance. The information given in the publication is, however, reviewed regularly. Necessary amendments are incorporated in the following editions. We would be pleased to receive any improvement proposals which you may have.

Copyright

Copyright (C) Deutschmann Automation GmbH & Co. KG 1997 – 2022. All rights reserved. This document may not be passed on nor duplicated, nor may its contents be used or disclosed unless expressly permitted. Violations of this clause will necessarily lead to compensation in damages. All rights reserved, in particular rights of granting of patents or registration of utility-model patents.

EtherCAT[®] is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

1 Download the TE1000 | TwinCAT 3 software

TwinCAT 3.1 – eXtended Automation Engineering (XAE)

https://www.beckhoff.com/en-en/support/download-finder/software-and-tools/

🗒 TwinCAT 3 - Version 3.1.4016.	12 - Setup	×
Microsoft Visual Studio settin Activate TwinCAT XAE settings		BECKHOFF
Would you like to activate the Existing settings will be overwr		licrosoft Visual Studio?
Microsoft Visual S	Studio 2010 Shell	
Microsoft Visual S	Studio 2012	
Microsoft Visual S	Studio 2013	
InstallShield		
	< <u>B</u> ack	Next > Cancel

2 ESI (EtherCAT Slave Information)

After installation, copy the device description file (ESI file) into following folder:

C:\TwinCAT\3.1\Config\Io\EtherCAT

Note: Depending on the ESI file used, the I/O sizes are either fixed or modular (configurable via EtherCAT master). An ESI file with modular I/O sizes was used to create this guide.

2.1 ESI - UNIGATE[®] CL, CM, CX, EL and MB:

An ESI file can be generated via the WINGATE configuration software if the "Universalscript Deutschmann" loaded in the delivery state is available in the devices.

Note: A sample device description file (ESI file) for which the I/O sizes can be configured via the EtherCAT master can be requested using the support form on the Deutschmann website.

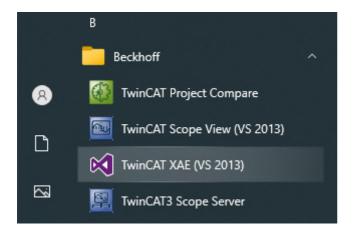
Attention: UNIGATE[®] CM and EL have been discontinued since 12/2018.

2.2 ESI - UNIGATE[®] IC and IC2

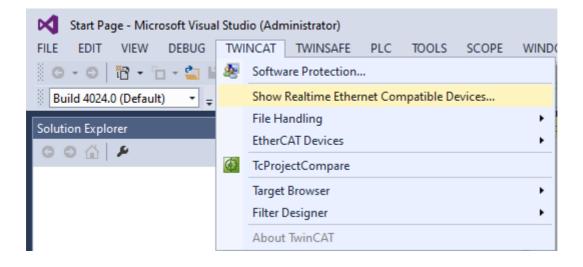
The sample device description file (ESI file) provided can be used as a basis for creating your own device description file. Deutschmann Automation also offers the creation as a service.

Note: The sample device description file (ESI file) is sent once with the first order. Further information regarding the creation of your own device description file can be found in the attached document 'esiQuickStart'.

3 Start TwinCAT V3



Check if your Ethernet Card is working with the software



If there is a device shown in the subfolder "Installed and ready to use devices", you can go on. If not, it must be added using the "Install" button.

Note: The devices listed here are examples and may have different names.

Installation of TwinCAT RT-Ethernet Adapters	x
Ethernet Adapters	Update List
Installed and ready to use devices(realtime capable) Installed and ready to use devices(realtime capable) Installed and ready to use devices(realtime capable) Installed and ready to use devices(realtime capable)	Install
Installed and ready to use devices(for demo use only) Installed evices	Update
Firmennetz - Intel(R) Ethernet Connection (2) I219-LM	Bind
	Unbind
- Disabled devices	Enable
	Disable
	Show Bindings

Either the "Universalscript Deutschmann" (not for IC+IC2), the template script for EtherCAT (part of the software Protocol Developer) or a customer-specific script must be loaded in the UNIGATE[®].

- Universal script Deutschmann: Among other things, the I/O sizes can be configured via the WINGATE configuration software.
- Template EtherCAT: Initially, 8 bytes I/O are set. These can be changed using the Protocol Developer software. The template is also the perfect basis for creating your own script.
- Custom Script: Function dependent on programming.

Then the UNIGATE[®] can be started in data exchange mode.

Note: If the UNIGATE[®] is started in configuration mode, 8 Byte I/O is set automatically.

Starting a new project.

×	Start Pag	ge - Micr	osoft Visua	l Studio (Adn	ninistrator)					
FILE	EDIT	VIEW	DEBUG	TWINCAT	TWINSAF	E	PLC	TOOLS	SCOPE	WINDO\
	New				•	17	Proj	ect	Ctrl+Sł	nift+N
	Open				•		Web	Site	Shift+A	Alt+N
	Close					'n	File.		Ctrl+N	

Assign a project name and click "OK".

New Project				? X
₽ Recent		.NET Framework 4.5	• # E	Search Installed Templates (Ctrl+E)
▲ Installed		TwinCAT XAE Project (XML format)	TwinCAT Projects	Type: TwinCAT Projects
Templates Other Project <u>WinCAT Proj</u> TwinCAT PLC TwinCAT Mea Samples Online	ects			TwinCAT XAE System Manager Configuration
		Click here to go online and find	templates,	
Name:	TwinCAT Project2			
Location:		ocuments\visual studio 2013\Projects	•	Browse
Solution name:	TwinCAT Project2	0		Create directory for solution OK Cancel

Scanning devices

Click right mouse button and select "Scan". Then click "OK".

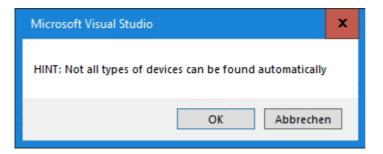
Note: If it is not possible to select "Scan", please, check whether TwinCAT is started in config mode.

FILE EDIT VIEW	🗀 - 😩 🗳 🖌	DEBUG TWINCAT	TWINSAFE PLC Attach			
Solution Explorer			→ ∓ X			
G ⊖ 🟠 [™] O -	ð 🖌 🗕					
Search Solution Explo	orer (Ctrl+ü)		<u>ب</u> م			
 ▲ TwinCAT Pro ▷ ▲ SYSTEM △ MOTION ○ PLC ④ SAFETY ○ C++ △ ANALYTI ▲ 2 I/O 	-					
ت <mark>1</mark>	Add New Item	Ins				
t o	Add Existing Item	Shift+Alt+A				
	Add New Folder					
	Export EAP Config File					
×	Scan					
۵	Paste	Ctrl+V				
	Paste with Links					

Config mode is indicated by the blue background of the config Icon in the status bar.



If the config Icon is highlighted in red TwinCAT is not in config mode.



Select device and click "OK". If no device appears, check the Ethernet connection.

1 new I/O devices found	x
Device 2 (EtherCAT)	OK Cancel Select All Unselect All

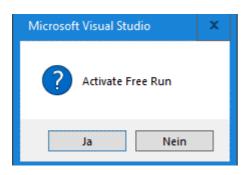
Click "Ja".

Microsoft Visual Studio 🛛 🗙					
? Scan for boxes					
Ja Nein					

If this window appears, the ESI file does not match the scanned hardware. Click, no and a new Box will be generated. For further instructions see chapter "New device found or mismatch with ESI file".

TwinCAT XAE				
New device type found (UNIGATE IC - "UNIGATE IC-EC(ESI)"). VendorId 0x19e ProductCode 0xe5b RevisionNo 0x2 Use available online description instead (YES) or try to load appropriate descriptions from the web				
Apply to all Yes No Online ESI Update (Web access required)				

Click "Ja" .



4 Selected device found

The seleced device was found \rightarrow UNIGATE[®] IC.

TwinCAT Project20 - Microsoft Visual Studio (Administrator)	
FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT TWINSA	FE PLC
💿 - 〇 范 - 🗀 - 😩 🔛 🚰 光 🗇 🏦 ヴ - ペ - 🕨 Attac	ch 👻
🔋 🖪 Build 4024.0 (Loaded) 🚽 🚽 🔛 🤷 🔛 🦉 🚺 🖉 🌮 🙀	TwinCAT Proj
Solution Explorer	→ ₽ ×
○ ○ ☆ io - i	
Search Solution Explorer (Ctrl+ü)	<u>ہ</u> م
 Solution 'TwinCAT Project20' (1 project) TwinCAT Project20 SYSTEM MOTION PLC SAFETY C++ ANALYTICS I/O Pevices Device 2 (EtherCAT) Image Inputs Outputs InfoData Mappings 	

Select the I/O size

Note: The I/O size must be match the setting in the user script. In the template script, 8 Byte I/O is set. This means, 8 Byte for input and 8 Byte for output must be set via the slots.

E.g. It is possible to use a 1 Byte input module 8 times. Or only one 8 Byte input module. The same applies for output.

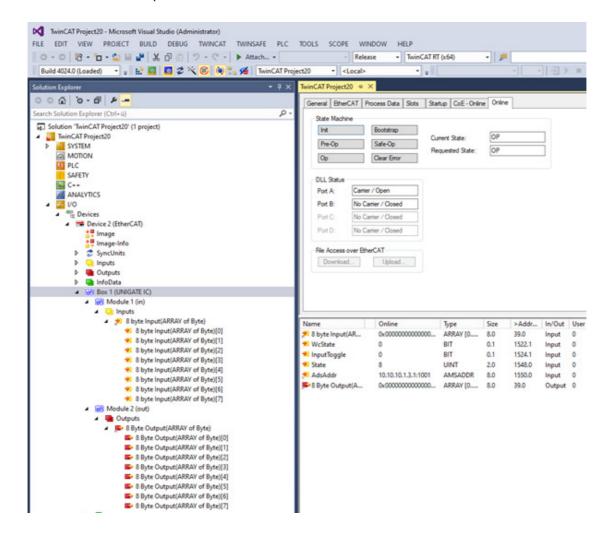
General	EtherCAT Process Dat	a Slots Startu	p CoE - Online Online		
Slot		Module	Mc	oduleIdent	
86	Unigate	in	Ox	80000008	
68	Unigate	out	Ox	00080000	
68	Unigate				
68	Unigate				
68	Unigate				
68	Unigate				
	Unigate				
68	Unigate				
	Unigate				
66	Unigate				
	Unigate				
RA	Uninate				
Down	nload SlotCfg	I->P)			

	F		-
	Module	ModuleIdent	Description
	Input(Slave to SPS)		
<	dð in	0x0000001	1 Byte In
	dð in	0x0000002	1 Word In
×	dð in	0x00000004	1 DWord In
	dð in	0x0000008	8 Byte Array In
	dð in	0x00000010	16 Byte Array In
	dð in	0x00000020	32 Byte Array In
	dð in	0x00000040	64 Byte Array In
	dð in	0x0000080	128 Byte Array In
	Output(SPS to Slave)		
	de out	0x00010000	1 Byte Out
	de out	0x00020000	1 Word Out
	de out	0x00040000	1 DWord Out
	out	0x00080000	8 Byte Array Out
	de out	0x00100000	16 Byte Array Out
	de out	0x00200000	32 Byte Array Out
	de out	0x00400000	64 Byte Array Out
	Relat	0~0080000	128 Rute Array Out

After that, click "Reload Devices".

TwinCAT Project20 - Microsoft Visual Studio (A	dministrator)
FILE EDIT VIEW PROJECT BUILD DEBU	IG TWINCAT
🕺 O - O 🛱 - 🗀 - 😩 💾 🍟 🕹 🗗 🖞	9-9-
🔋 🛛 Build 4024.0 (Loaded) 🛛 🚽 🔛 🧧 🔛 🥰	। 🔨 🐻 🚺
Solution Explorer	Reload Devices

Now the device is in operational mode and the selected I/O sizes are available.

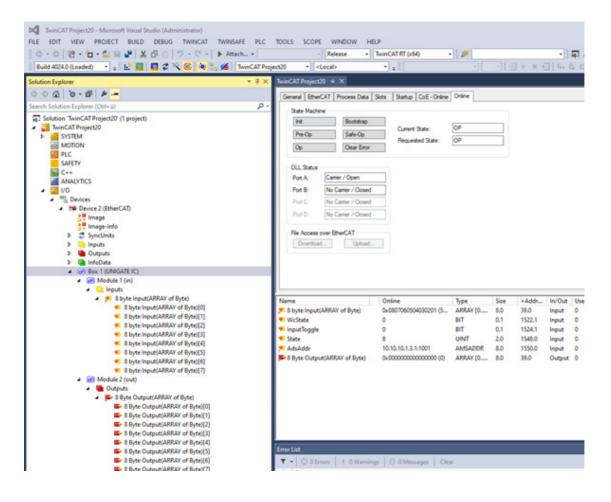


19.4.22

Serial data can be sent to the UNIGATE® UART via the Starter Kit software module RS232.

📧 RS 232 Mo	dule					-		x
File Options	Extras	Help						
Userdata (E.g.:	A, \65 \	\h41 \b01000001\)						
\01\\02\\03\\0	4\\05\\06	\\07\\08\				•	<u>S</u> e	end
Send data hexad 01 02 03 04 05								
		🔲 Ind	rement	Autorepeat Of	f 1000	ms 🔻	Rep	peat
time	length	data(hex)	da	ta(ASCII)				
08:10.12,565	8	01 02 03 04 05 06 07 08						
time	length	data(hex) data	(ASCII)					
Monitor Data						Receiv	e Delay 51	0 ms 🔻
Rs232Modul V	3.3	Senddatalength: 8						

The serial data is displayed in the input data.



5 New device found or mismatch with ESI file

Double click on Box 1 (P00000E5B R0000002).

TwinCAT Project20 - Microsoft Visual Studio (Administrator) FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT TWINSAFE Image: I	•
	Ψ×
Search Solution Explorer (Ctrl+ü)	ہ م
 Solution 'TwinCAT Project20' (1 project) TwinCAT Project20 SYSTEM MOTION PLC SAFETY C++ ANALYTICS I/O Device 2 (EtherCAT) Image Image Image Image Image Image Image Image Inputs Outputs Motuputs <l< td=""><td></td></l<>	
Mappings	

Select "EtherCAT" and "Advanced Settings..."

General EtherCAT	Process Data Startup CoE - Online Online
Туре:	
Product/Revision:	3675 / 2
Auto Inc Addr:	0
EtherCAT Addr:	1001 Advanced Settings
Identification Value:	0
Previous Port:	Master V

Open "Smart View" and click the button "Write EProm"...

Advanced Settings			x
🖅 General	Smart View		
Configured Clock Esc Access Esc Access Esc Access Configured Statio Enhanced Link De Smart View Hex Editor FPGA Memory	Config Data (evaluated from ESC) EPPROM Size (Byte): PDI Type: Device Emulation (state machine emulation) SPI / 8 / 16 µC Interface BUSY Open Drain BUSY High Active INT Open Drain INT High Active 32 Bit Interface WD Open Drain WD High Active Input Latch	Device Identity (hex) Vendor Id: Product Code: Revison No.: Serial No.: Product Revision: Mailbox CoE SoE AoE	
	Sync Signal Configuration SYNC0 Open Drain SYNC0 High Active SYNC0 Enabled SYNC0 to PDI IRQ SYNC1 Open Drain SYNC1 High Active	Bootstrap Configuration Out Start/Length: 0 0 In Start/Length: 0 0 0	
	SYNC1 Enabled SYNC1 to PDI IRQ Impulse Length (µs):	Out Start/Length: 0 0 In Start/Length: 0 0	
< III >	Write EIPROM Read EIPROM		
		OK Abbre	chen

Select the desired ESI file and click OK. The EPROM is rewritten.

Write EEPROM		x
Available EEPROM Descriptions:	Show Hidden Devices	OK
Beckholf Automation GmbH & Co. KG Getway RS - EtherCAT Get UNIGATE CL-EC[ESI neu] (3573 / 1) CALUNIGATE IC-EC[ESI] (3675 / 2)		Cancel Browse

Note: If the file you are looking for is not displayed, the device descriptions must be reloaded. (see chapter 7 for more.)

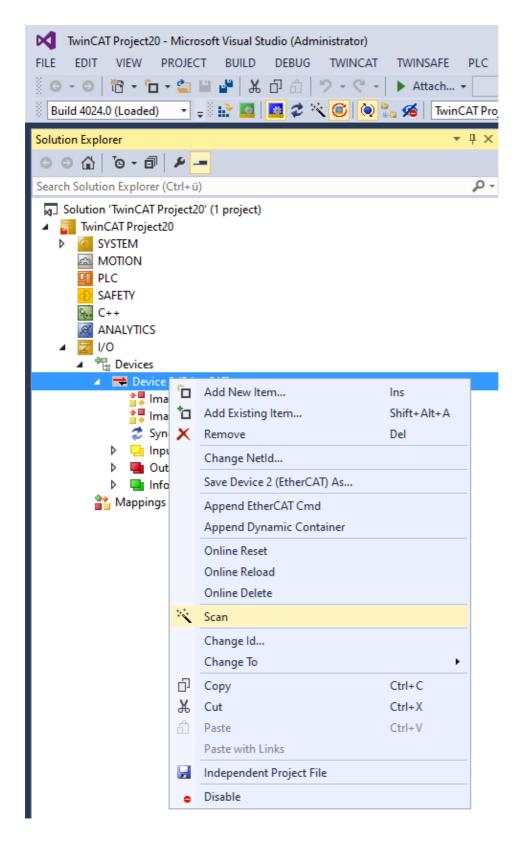
	Smart View			
Mailbox Distributed Clock ESC Access E-EPROM - Configured Statio - Enhanced Link De - Smart View - Hex Editor - FPGA - Memory	Config Data (evaluated from ESC) EPPROM Size (Byte): PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI Type: PDI T	Device Identity (hex) Vendor Id: Product Code: Revison No.: Serial No.: Product Revision: Maibox CoE SoE AoE Bootstrap Configuration Out Start/Length: In Start/Length: Standard Configuration Out Start/Length:	С	FoE
	Write EIPROM Read EIPROM	In Start/Length:	0	0

After the description of the EPROM, the advanced settings can be closed with "OK".

Then remove Box 1

G • 0 📅 • 🛅 • 🚔 💾 🖬	BUILD	DEBUG TWINCAT TWINSAFE PLC		TOOLS tt20
Solution Explorer Search Solution Explorer (Ctrl+ ü) Solution 'TwinCAT Project20' (1 p Solution 'TwinCAT Project20' (1		・ 中 : ()	ľ	TwinCAT I General Type: Produc Auto Ir EtherC Identif Previo
🔺 🔶 Box 1 (P00000E				
👂 🛄 InfoData		Add New Item	Ins	;
🍟 Mappings		Insert New Item		-
	×	Insert Existing Item Remove	De	
	^		De	
		Save Box 1 (P00000E5B R0000002) As	~	
	¥ D	Copy Cut		rl+C
	њ Л	Paste		rl+X rl+V
		Paste with Links	Ct	
		Independent Project File		
		Disable		
	•	Change to Compatible Type		
		Add to HotConnect group		
		Delete from HotConnect group		
1		2F		

After that, the connected devices must be scanned again.



19.4.22

A new Box 1 (UNIGATE[®] IC) appears.

TwinCAT Project20 - Microsoft Visual Studio (Administrator)
FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT TWINSAFE PLC
💿 - 💿 📅 - 🗀 - 😩 💾 🚜 🗗 🏦 🥠 - 🤍 - 🕨 Attach
🔋 Build 4024.0 (Loaded) 🔹 🚽 🔛 🧧 🗖 🧭 🏹 🎯 🧔 🔏 🛛 TwinCAT Proj
Solution Explorer 🔹 🕂 🗙
○ ○ ☆ io - i ► -
Search Solution Explorer (Ctrl+ü)
 Solution 'TwinCAT Project20' (1 project) TwinCAT Project20 SYSTEM MOTION PLC SAFETY C++ ANALYTICS I/O Devices Devices Device 2 (EtherCAT) Image Image<
Mabbuda

Depending on the ESI file, the sizes of input and output are either permanently stored in the ESI file or can be configured via TwinCAT. If the sizes of input and output are permanently stored in the ESI file, the device should be now in operational mode.

If not, the sizes of input and output must be configured via EtherCAT master. For more see chapter 6.1.

6 Input and Output Modules

6.1 Input and Output modules configured via EtherCAT Master

To configure the input and output modules, the "Slots" menu item must be selected.

Slot		Module	ModuleIde	ent	-		Module	ModuleIdent	Description	
68	Unigate	in	0x000000	800		- [Input(Slave to SPS)			
68	Unigate	out	0x000800	000		<	del in	0x00000001	1 Byte In	
68	Unigate						in line	0x00000002	1 Word In	
68	Unigate					×	del in	0x00000004	1 DWord In	
68	Unigate						Gel in	0x00000008	8 Byte Array In	
68	Unigate						del in	0x00000010	16 Byte Array In	
68	Unigate						del in	0x00000020	32 Byte Array In	
68	Unigate						del in	0x00000040	64 Byte Array In	
68	Unigate						del in	0x00000080	128 Byte Array In	
BB	Unigate						Output (SPS to Slave)		
68	Unigate						de out	0x00010000	1 Byte Out	
68	Unigate						de out	0x00020000	1 Word Out	
68	Unigate						de out	0x00040000	1 DWord Out	
68	Unigate						out out	0x00080000	8 Byte Array Out	
68	Unigate						de out	0x00100000	16 Byte Array Out	
66	Unigate						de out	0x00200000	32 Byte Array Out	
68	Unigate						GRI not	0v00400000	64 Rute Array Out	
1RA	Uninate				Ŧ		•			

Now the device is in operational mode

General Eth State Mac Init Pre-Op Op	herCAT Process Data Slots chine Bootstrap Safe-Op Clear Error	Current State: Requested State:	Online OP OP
DLL Statu	IS		
Port A:	Carrier / Open		
Port B:	No Carrier / Closed		
Port C:	No Carrier / Closed		
Port D:	No Carrier / Closed		
File Acce	pad Upload		

If the I/O size are subsequently changed, the button "Reload Devices" must be clicked.

TwinCAT Pro	ject20 - Microsof	t Visual Stud	lio (Admin	istrator)
FILE EDIT VIE	W PROJECT	BUILD	DEBUG	TWINCAT .
G • O 🗗	• 🛍 • 當 🔛	📲 🗶 ć	P 🖞 🕹) - C -
Build 4024.0 (Lo	aded) 🔹 🛫	12 🖪 🛛	🛯 🤣 🔨	6 🖉 🗞
Solution Explorer			Relo	ad Devices

7 Reload Device Description

A device description file (ESI file) can be reloaded via the menu point "TWINCAT" \rightarrow "EtherCAT Devices" \rightarrow "Relaad Device Descriptions".

<u>.</u>	Software Protection	- TwinCAT RT (x64) - 🗾 🎜
₽	Activate Configuration Restart TwinCAT System	• =
10 10 N	Restart TwinCAT (Config Mode) Reload Devices Scan	ess Data Slots Startup CoE - Online Online
© © 10 %	Toggle Free Run State Show Online Data Show Sub Items Hide Disabled Items	laar Error Current State: OP Requested State: OP
RE6	Access Bus Coupler/IP Link Register Update Firmware/EEPROM	Dpen
	Show Realtime Ethernet Compatible Devices File Handling Selected Item	r / Closed r / Closed
	EtherCAT Devices	Update Device Descriptions (via ETG Website)
0	TcProjectCompare Target Browser Filter Designer	Reload Device Descriptions Manage User Defined Whitelist Manage User Defined Blacklist
	About TwinCAT	

Note: Only files that were in the following folder before TwinCAT was started are displayed.

 $C:\TwinCAT\3.1\Config\lo\EtherCAT$

8 Servicing

Should questions arise that are not covered in this manual you can find further information in our

• FAQ/Wiki area on our homepage www.deutschmann.com or directly in our Wiki on www.wiki.deutschmann.de

If your questions are still unanswered please contact us directly.

Please note down the following information before calling:

- Device designation
- Serial number (S/N)
- Article number
- Error number and error description

Your request will be recorded in the Support center and will be processed by our Support Team as quickly as possible (Usually in 1 working day, rarely more than 3 working days.).

Technical Support hours are as follows:

Monday to Thursday from 8 am to midday and from 1 pm to 4 pm, Friday from 8 am to midday (CET).

Deutschmann Automation GmbH & Co. KG Carl-Zeiss-Straße 8 D-65520 Bad-Camberg Germany

Central office and sales department	+49 6434 9433-0
Technical Support	+49 6434 9433-33
Fax sales department	+49 6434 9433-40
Fax Technical Support	+49 6434 9433-44
E-mail Technical Support	support@deutschmann.de

8.1 Returning a device

If you return a device, we require as comprehensive a fault/error description as possible. We require the following information in particular:

- What error number was displayed?
- What is the supply voltage (±0.5 V) with Gateway connected?
- What were you last doing or what last happened on the device (programming, error on powerup, ...)?

The more precise information a fault/error description you provide, the more exactly we will be able to pinpoint the possible causes.

8.2 Downloading PC software

You can download current information and software free of charge from our Internet server. http://www.deutschmann.com